

# Building the Perfect Pitcher

## The Methodology



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## Disclaimer

The information in this book is offered for educational purposes only; the reader should be cautioned that there is an inherent risk assumed by the participant with any form of physical activity. Please consult your physician prior to starting any exercise related activity. Anyone participating in these activities should understand that such training initiatives may be dangerous if performed incorrectly, and may not be appropriate for everyone. The author assumes no liability for injury; this is purely an educational manual to guide those already proficient with the demands of such programming.

In recent years, success as an elite baseball pitcher has become more of a science than an art. There are anomalies who rely primarily on innate talent, but they are just that: outliers whose achievements do not overshadow the importance of meticulous training and preparation. The goal of this series is to maximize a pitcher's on-field performance by developing his core athletic competencies. Athletes with a firm grasp of fundamentals are in the best position to master the finer points of a sport, and the same is true for those intent on pitching at the highest levels of the game.

Of course, the road to pitching perfection is full of danger. For example, the pursuit of consistently high velocity or mastery a secondary pitch (attributes of many elite pitchers) increases the risk of injury.<sup>1</sup> However, this risk can be significantly reduced through the use of this guide along with proper self-assessment,

training, and instruction. Please keep my philosophical hierarchy in mind as you read this book and integrate its teachings into your training regimen:

### **#1: Injury Reduction or Injury Prevention**

If you learn nothing else from this guide, you will get your money's worth. In every phase of training, your goal is to optimize on-field performance, not to jeopardize it. By purchasing this book you have agreed that **you are an athlete and not** a bodybuilder, powerlifter, strongman, or Olympic lifter. Thus, this guide includes training methods from these sports, but not to the detriment of your health, safety, or performance. It is your job to listen to your body and to use good judgment when supplementing your baseball training with exercises from other sports.

### **#2: Posture Dictates Function**

Posture is a painfully boring topic for most athletes, but our sedentary twenty-first century lifestyles require us to be mindful of the way we sit, stand, and move. All of the training in this book will help to optimize posture, but with 168 hours in a week, no five hours of training can counteract the damage that poor posture causes unless you make good posture a habit. **Correct your posture and magical things will start to happen; pain and injuries will disappear, while power and on-field performance will increase.**

### **#3: Force Production/Force Transfer is King**

**The ability to apply force into the ground and transfer it efficiently through your fingers is the key to increasing ball velocity.** Larger individuals often are able to put more force in the ground, transfer it through their bodies, and channel it into the ball more effectively than their smaller counterparts. Increased bodyweight and longer levers allow large pitchers' transfers to be

highly fluid, but over time we have discovered that techniques grounded in basic physics can allow smaller pitchers to generate and transfer as much force as larger pitchers.

## **Introduction**

Although Major League Baseball pitchers represent 49% of the professional baseball population, they account for 68% of the total time spent on the disabled list each season.<sup>2</sup> 57% of all Major League pitchers suffer from a shoulder injury during the season -- often to the rotator cuff or glenoid labrum -- many of which lead to tearing, impingement, degeneration, or overuse syndrome.<sup>3</sup>

About once every year I receive a frantic call from one of my college or professional baseball players, fresh off an MRI confirming labral tears in his shoulder. After calming the player down, I congratulate him for having the same shoulder mechanics as just about every MLB baseball player. The labrum's job is to

provide stability to the shoulder joint, and tears in the labrum allow for just enough instability to achieve the increased range of motion that baseball players require to throw the ball effectively. Each player's tear is different, but more often than not, proper strength training will provide enough muscular stability to render the tear pain-free and eliminate the need for surgery.

Baseball is often behind the curve with regard to training modalities and conditioning. Pitchers have historically been treated as endurance athletes because of the long duration of the game, and thus their training regimens have featured heavy doses of distance and pole running. Recently, however, experts have begun to challenge this paradigm, arguing instead that pitching is an explosive burst motion that is repeated many times throughout a game (hence the misconception of pitching as an endurance activity). It comes as no surprise, then, that both anecdotal and



scientific evidence indicate that endurance training actually inhibits the pitching motion.<sup>4</sup>

Those who have made the jump from endurance training to strength training have witnessed immediate results on the mound. Specifically, appropriate strength training regimes have proven to help with injury prevention, strength, pitching velocity and skill-specific endurance. In fact, the importance of strength training in baseball is now so universally recognized that that Major League Baseball and Minor League Baseball require every level of every organization to employ a Strength and Conditioning Coach on their staff.

## **Upper Extremities**

Shoulder range of motion (ROM) contributes to both ball velocity and injury prevention in pitchers.<sup>5-7</sup> Pitchers often have glenohumeral internal rotational deficit (GIRD)<sup>8</sup>, which increases

the risk of internal impingement, superior labrum from anterior to posterior (SLAP) lesions, and general pain due to the rotator cuff's inability to efficiently decelerate the arm during a pitch.<sup>9,10</sup> Studies show that total arc or total ROM between pain-free pitchers' dominant and non-dominant arms are not statistically different, but that these pitchers' dominant arms have greater external rotation due to retroversion from pitching during their preadolescent years. The same studies have also identified a decrease in total ROM in the throwing shoulder compared to the non-throwing shoulder.<sup>11,12</sup> ROM deficiencies are addressed primarily through the sleeper stretch, which has proven effective in increasing total shoulder ROM in both pitchers and non-pitchers and may be especially beneficial for those suffering from GIRD.<sup>13</sup> Ultimately, these studies suggest that an early assessment of a

pitcher's shoulder range of motion can predict and help prevent shoulder injuries.

The scapula or shoulder blade is a major contributor to the movement, stability, and overall health of the shoulder. Scapular dyskinesis is a common injury among pitchers, which inhibits control of the shoulder movement and has been shown to cause numerous shoulder and arm injuries as a result.<sup>14</sup> Kibler found that patients with gleno-humeral instability had instability in their scapula one hundred percent of the time.<sup>15</sup> Likewise, Oyama et al. found that the dominant-side scapula of overhead athletes was significantly more winged and anteriorly tilted than the nondominant-side scapula of overhead athletes.<sup>16</sup> It has also been reported that a positive relationship exists between GIRD and abnormal scapular positioning, particularly increased anterior tilt.<sup>17</sup>

Pitchers are predisposed for shoulder injuries due to poor scapular positioning which leads to instability in the shoulder and an increase in GIRD. However, these predispositions can be minimized by training the muscles that stabilize the scapula and increasing thoracic (upper back/spine) mobility to improve scapular placement.<sup>16,18</sup> As demonstrated in the assessment and programming sections below, thoracic and scapular mobility, along with periscapular strength are among the primary focuses in achieving and maintaining shoulder function and health.

The elbow is another complex apparatus that is both essential to the pitching motion but highly susceptible to injury. Elbow injuries among pitchers are most often a product of repetitive microtrauma from the pitching motion.<sup>19</sup> Wright et al found that professional pitchers' throwing elbows frequently degenerate over time.<sup>20</sup> Although any number of pathologies can produce elbow

injuries, a high percentage are attributable to elbow ROM and soft tissue restrictions.<sup>21</sup> Asymptomatic elbow pain is also common among pitchers and can lead to structural damage if left untreated.<sup>18</sup> McCall et al.'s research requests evaluation of pitchers' elbow joint ROM to detect increased injury risk and promptly treat the athlete to prevent structural damage.<sup>21</sup>

In sum, elbow pain is not something to be taken lightly. Because of the high degree of codependence among the different parts of the elbow, I believe that untreated tightness or pain in the elbow or forearm can often grow into more serious elbow injuries. I do not have the research to support this claim just yet, but I am confident that forearm tightness is the precursor to many UCL/Tommy John injuries. Training is an important first step in injury prevention, but pitchers should consult with a qualified

practitioner at the first sign of pain or discomfort in or around the elbow.

## **Lower Extremities**

Asymmetrical patterns in the pitching motion have been shown to cause strength and flexibility imbalances. Namely, studies evaluating baseball pitchers' and tennis players' hip ROM have identified a loss of internal rotation of the lead hip because of the repetitive nature of the two motions.<sup>22</sup> Vad et al. found a positive correlation between this condition, known as hip internal rotation deficit (HIRD), and lower back pain in tennis players.<sup>23</sup> These studies also contend that asymmetric hip joint ROM, especially in the lead hip, may indicate a heightened risk of injury. Minimizing hip ROM asymmetries through evaluation and flexibility training is one of the most important aspects of maintaining a pitcher's health and effectiveness on the mound.

Hips are merely one lower extremity that require a pitcher's attention. Because pitching depends so heavily on generating power from the ground and transferring it through the body, leg strength and usages are critically important parts of success. To this end, Tippet examined the strength and active ROM of stance leg and kick leg asymmetries of college pitchers. Tippet's study concluded that the active ROM of plantarflexion, hip internal rotation, and hip extension were significantly greater in the stance leg than in the kick leg. Significant differences in strength were seen in the kick leg hamstrings and the stance leg hip external rotators. Tippet states that bilateral asymmetries should be considered when training pitchers for strength and flexibility.<sup>24</sup> Put simply, pitchers gain strength and range asymmetrically in the lower half. To combat these imbalances, particular emphasis

should be placed on single-leg strengthening and power training throughout the duration of the program, including in-season.

## **Pitching Mechanics**

It has been suggested that, as muscular fatigue sets in during a game, velocity decreases and pitching mechanics begin to deviate from their ideal form. Escamilla et al. tested this hypothesis in a simulated game with ten collegiate pitchers and confirmed that with the advent of fatigue, ball velocity and trunk flexion during ball release both decrease. This common pitfall can be avoided through repetitive strength training, which allows a pitcher to replicate his optimal mechanics and maintain ball velocity deeper into a game.<sup>25</sup>

## **Training**

Strength and power in the lower body are important qualities for a pitcher to attain. Dodd et al. tested the short term (4 weeks)



effects of three different interventions including complex, strength, and plyometric training on 45 male collegiate baseball players on lower body strength and throwing velocity. The pre- and post-test results showed significant improvements in all training types, but no considerable differences among the interventions. The study's findings suggest that training is important, but that the method is not significant over a short period of time.<sup>26</sup>

**Power is the expression of strength and speed; without appreciable levels of strength, power cannot be optimized.** For this reason, *Building the Perfect Pitcher* prioritizes foundational movement and strength before power.

DeRenne et al. conducted numerous overweight and underweight throwing studies, all of which concluded that overweight throwing, underweight throwing, and a combination of the two all increase pitching velocity. In all five studies, there was a

four to six percent increase in pitching velocity and no injuries reported. The studies used balls ranging from between 20% lighter than a regulation baseball, which weighs five ounces, to 20% heavier. Intervals of throwing were three days per week with six- to ten-week interventions. The throwing programs called for a general warm up, followed by light throwing from forty-five feet with a regulation ball, ten minutes of throwing from sixty feet with a regulation ball, and concluding with ten minutes with either a weighted or underweighted implement. DeRenne et al.'s work suggests that weighted and underweight baseballs are an effective and safe means to increase ball velocity.<sup>27-29</sup>

Many coaches are either strongly in favor of or strongly opposed to the use of weighted and underweight balls. I believe that they can be an outstanding tool when used appropriately, but that they also can have severe consequences when used with

dysfunctional mechanics or with inadequate strength training for the neck and shoulder. In any case, be sure to consult a qualified practitioner and a pitching coach to ensure that weighted and underweight balls are right for you before you incorporate them into your throwing program.

## **Conditioning**

Conditioning is a critical portion of any strength and conditioning program. Unfortunately, methods may harm a pitcher's on-field performance more than they enhance it.

The first misconception about distance and pole running is that they help to remove excess lactate from the blood after a pitching outing. This belief embodies a basic misunderstanding of the physiology of pitching. Pitching is a maximum effort burst movement that is repeated dozens of times over the course of a game. The burst motion of pitching relies on the phosphogen or

ATP-CP system, which is regarded as a lactic anaerobic energy system because it neither uses oxygen nor produces lactic acid if oxygen is unavailable. In laymen's terms this means that, contrary to popular belief, pitching does not increase blood lactate levels significantly. Therefore, "flush" runs designed to lower blood lactate levels merely expose pitchers to an increased risk of injury without bestowing any measurable benefit.<sup>30</sup>

Distance and pole running present other problems as well: a lack of neural adaptation (high powered nervous system output); limited or diminished strength gains; and an underdeveloped range of motion in portions of the lower body that are essential to the pitching motion. Holloszy and Booth produced the following paragraph while studying the biochemical adaptations to endurance exercise in muscle.

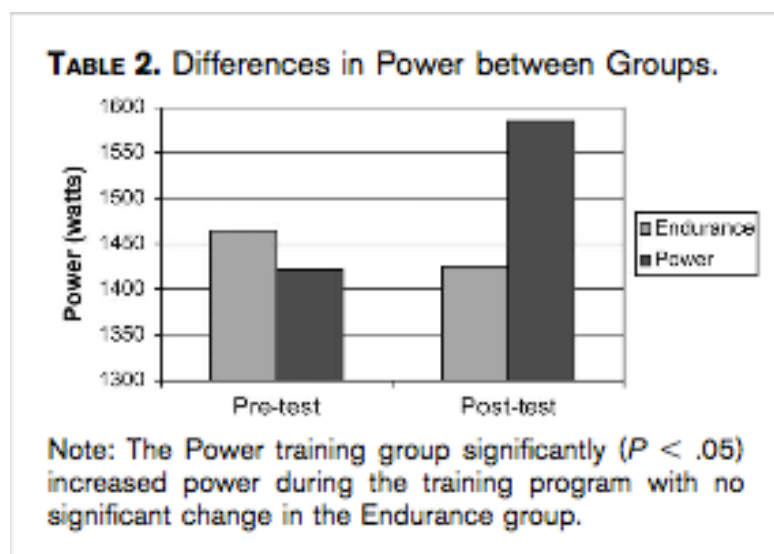
“The nature of the exercise stimulus determines the type of adaptation. One type of adaptation involves hypertrophy of the muscle cells with an increase in strength; it is exemplified in its most extreme form by the muscles of weight lifters and bodybuilders. The second type of adaptation involves an increase in the capacity of muscle for aerobic metabolism with an increase in endurance and is found in its most highly developed form in the muscles of competitive middle- and long distant runners, long distant cross country skiers, bicyclists, and swimmers. Although many types of physical activity can bring about varying degrees of both types of adaptation in the same muscle, it does appear that these adaptations can occur quite independently of each other in their most extreme forms. For example,

the hypertrophied muscles of weight lifters do not appear to have increased respiratory capacity, whereas the muscles of rodents trained by prolonged daily running, which have large increase in respiratory capacity, are not hypertrophied and show NO INCREASE IN STRENGTH”<sup>31</sup>

As I have discussed, bodyweight is directly correlated to ball velocity. Distance running reduces an athlete’s fast twitch muscle fiber count and muscle mass, which leads to diminished overall body mass and ultimately robs a pitcher of crucial miles per hour on his pitches. However, there is good news even for pitchers who have unwittingly sacrificed body mass and velocity by doubling as distance runners.

Further proof that pitchers should avoid distance running is offered in a tremendous article titled “Noncompatibility of Power and Endurance Training Among College Baseball Players.” This

study split 16 Division I collegiate pitchers on the same team into 2 groups, both of which were tested before and after the season. The sprint group performed repeated maximal sprints ranging from 15 to 60 meters with 10 to 60 seconds rest between each sprint. Workouts were performed 3 days per week and consisted of 10–30 sprints. The second group (8 Pitchers) performed moderate- to high-intensity aerobic exercise (jogging or cycling) 3–4 days per week for 20–60 minutes per day (mainly poles). Over the course of the season, the sprint group increased power by ~20% while the endurance group decreased power by ~ 3%. That's dramatic.<sup>32</sup>



In short, pitchers should think long and hard before incorporating distance and/or pole running into their training routines. Basic physiology suggests (and the research confirms) that these endurance-based practices jeopardize a pitcher's power, muscle mass, and skill-specific endurance. Any pitcher intent on succeeding at the highest levels of the game should focus on building and maintaining muscle mass and fine tuning mechanics to optimize the power transfer between his wind-up and delivery. Ball velocity is, and always will be, the factor that separates the wheat from chaff. **Pitching is a repeated max effort movement,** your training should replicate it.

Just because a practice has become tradition does not mean that it is the best, or even a good way, to enhance on-field performance. Further research and anecdotal evidence will



undoubtedly reveal even better ways than the ones I offer above to optimize a pitcher's output.

## **Conclusion**

Research indicates that with improved mechanics and appropriate training, a pitcher's performance can be increased without any additional risk of injury. Increased shoulder ROM, periscapular strength, proper scapular positioning and soft tissue mobilization should be the main priorities when preventing and treating upper extremity injuries. Increasing lead hip ROM and correcting bilateral asymmetry are paramount when working with lower back and lower body injuries in the pitching population. Further, both in- and off-season training should incorporate soft tissue and joint mobilization to minimize the effects of overuse stresses on the muscular and joint systems.

In addition to injury prevention, strength and power training programs should be pursued to increase ball velocity. Using weighted and underweighted balls could also increase velocity in the right circumstances. These variables will be properly manipulated by your assessment and the resulting program, and will set you up to realize your athletic potential and optimize your pitching performance.

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